2004

McPherson County Test Hole Logs

James W. Goeke
University of Nebraska-Lincoln, jgoeke1@unl.edu

MCPHERSON COUNTY
Test-Hole Logs

Written in Part and Revised and Compiled in Part
from Previous Works

by
James W. Goeke

Nebraska Water Survey
Test-Hole Report No. 60

Conservation and Survey Division
School of Natural Resources
Institute of Agriculture and Natural Resources
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April 2004

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Publication and price lists are furnished upon request.

April 2004

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Many other persons contributed during short periods of time to the test-hole drilling, both in the field and in the office. The review, arrangement, and final assembly of all the data were performed principally by Robert F. Diffendal, Jr., and James W. Goeke. Typing was done by Melba Stemm. Ann Mack drafted the figures. Duane Mohlman and Rod Vasek aided in revision and production.

Conservation and Survey Division
School of Natural Resources
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
102 Nebraska Hall
Lincoln, Nebraska 68588-0517

Main Office:	402-472-3471
Publication Sales:	402-472-7523
Fax:	402-472-4608
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INTRODUCTION

In 1930, the Conservation and Survey Division (CSD) of the University of Nebraska and the U.S. Geological Survey began a program of cooperative groundwater studies in Nebraska. Since then test drilling by use of rotary drilling equipment has been an integral part of that program. This report contains logs of all the test holes drilled in McPherson County under the program as well as those drilled by the Conservation and Survey Division with financial assistance from other government agencies.

The maps in this report show the locations of all test holes drilled in the county since 1934 (Figure 1).

Present techniques of test-hole logging and sampling include use of drilling mud suitable to drilling conditions, timing by stopwatch of the drilling of each 5-foot increment of depth, and removal of all cuttings from the test hole at intervals of 5 feet or less. During the drilling of the hole, cuttings from each interval are examined immediately; samples representing each 5-foot interval and each recognizable change in material are retained. After samples are washed, they are described lithologically and the color is evaluated by comparison with standard color charts. The samples then are dried, cataloged, and stored. All samples are processed and kept on open file in the offices of the Conservation and Survey Division, 113 Nebraska Hall, University of Nebraska-Lincoln, Lincoln, Nebraska, 68588-0517.

Beginning in September 1951, some of the test holes have been logged electrically. Geophysical logs (e-logs) often can be used to determine formation boundaries more precisely than by field sampling, especially where differences in rock types from one formation to another occur at the boundary. Figure 2 is an example of geophysical logs of a test hole from McPherson County (8-S-82) with formation boundaries shown. Departures of the curves from the center lines generally indicate that the geologic unit is becoming coarser grained. A notation on each test-hole log indicates if geophysical logs are part of the original test-hole data in the CSD office in Lincoln, Nebraska.

This publication is one of a series being issued to make more readily available the record of test holes drilled since 1930. The series of publications is made on a county basis and includes, with some exceptions, logs of all test holes drilled in each of the counties. The logs have not been reviewed for conformance with editorial standards and nomenclature. In the case of McPherson County, descriptions of strata done in earlier test-hole reports are included with some revised formation information in this report.

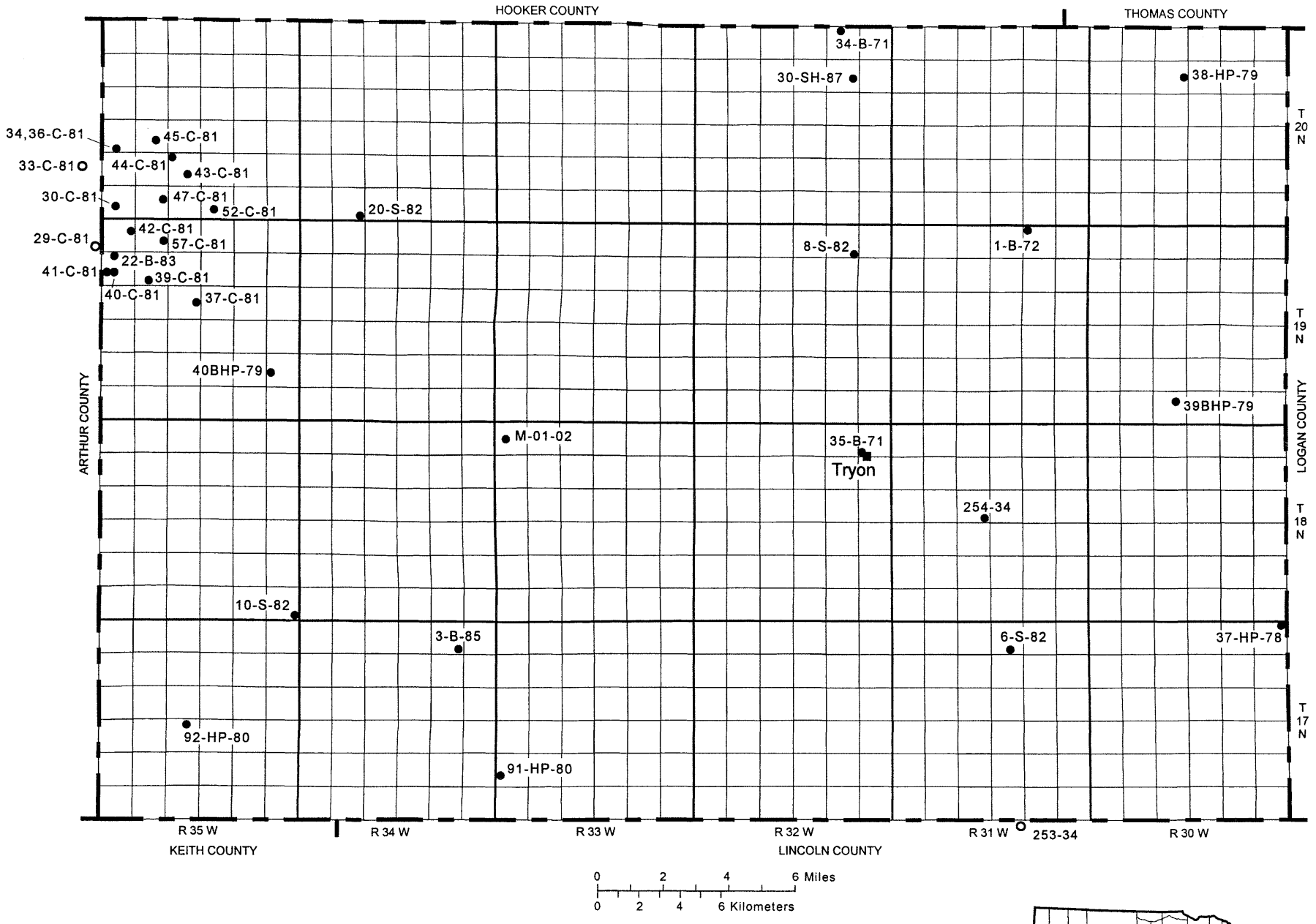


Figure 1. Test-hole location map of McPherson County

Figure 2. McPherson County sample geophysical logs (8-S-82)

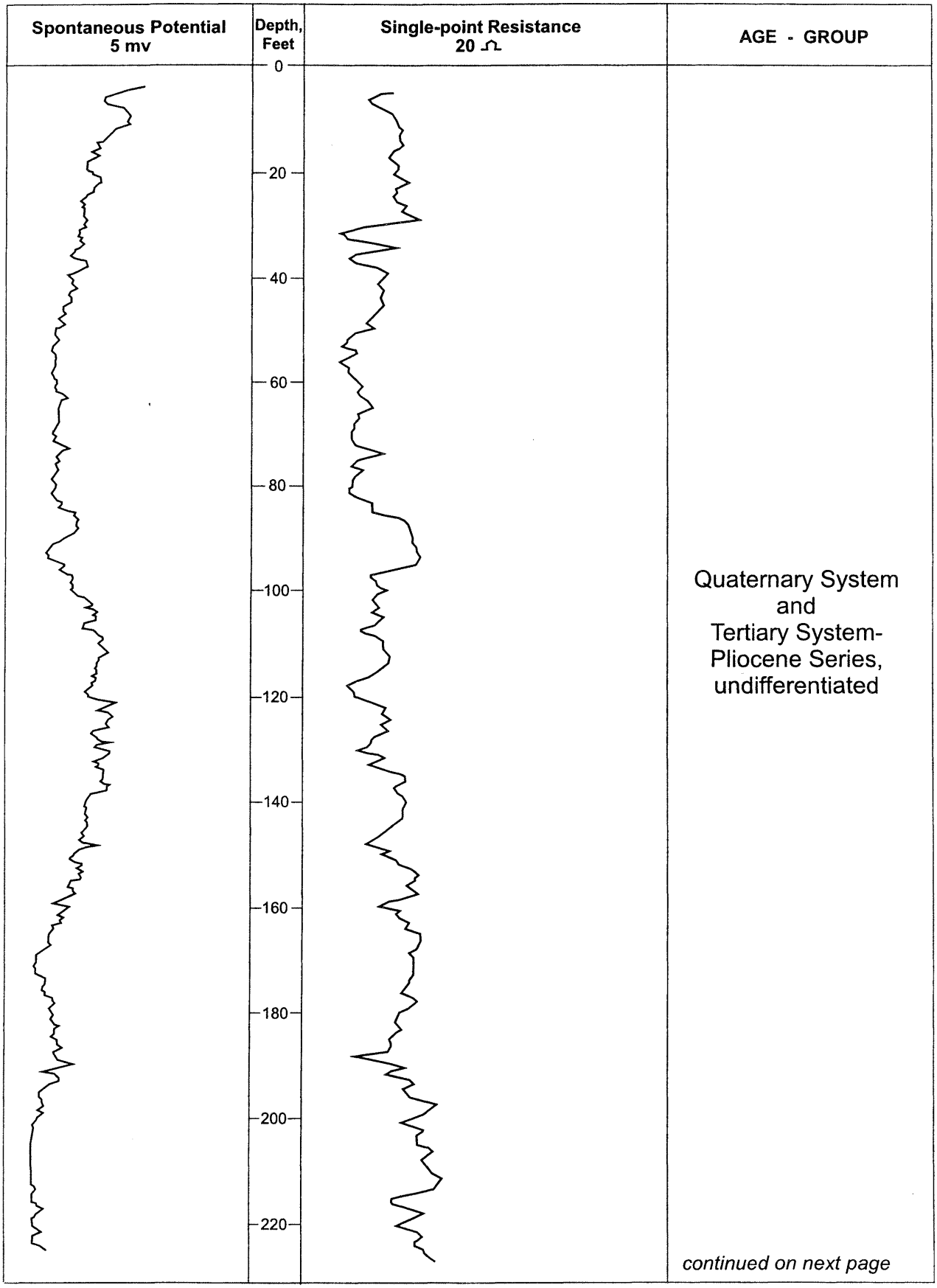
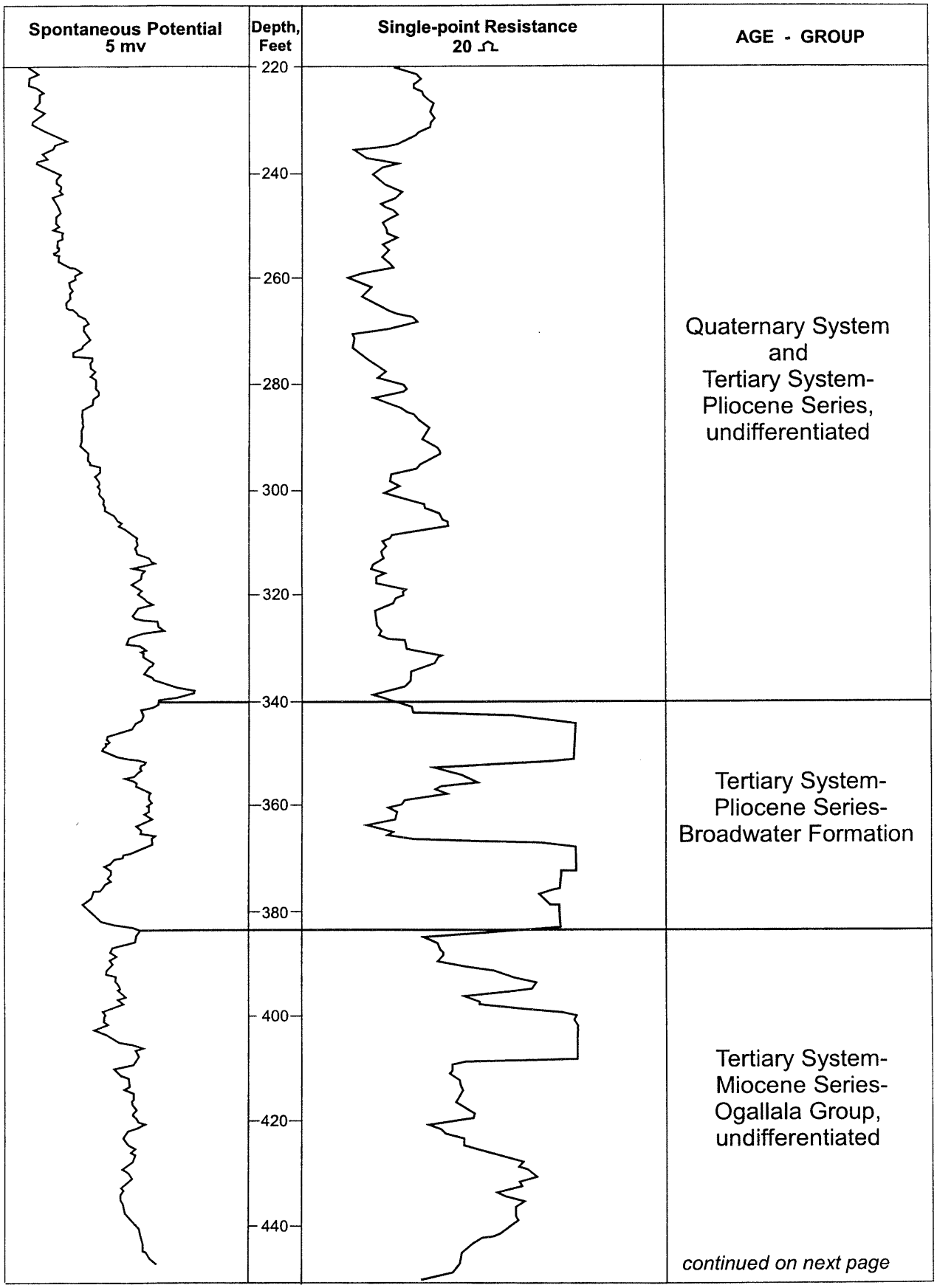


Figure 2 continued. McPherson County sample geophysical logs (8-S-82)



continued on next page

Figure 2 continued. McPherson County sample geophysical logs (8-S-82)

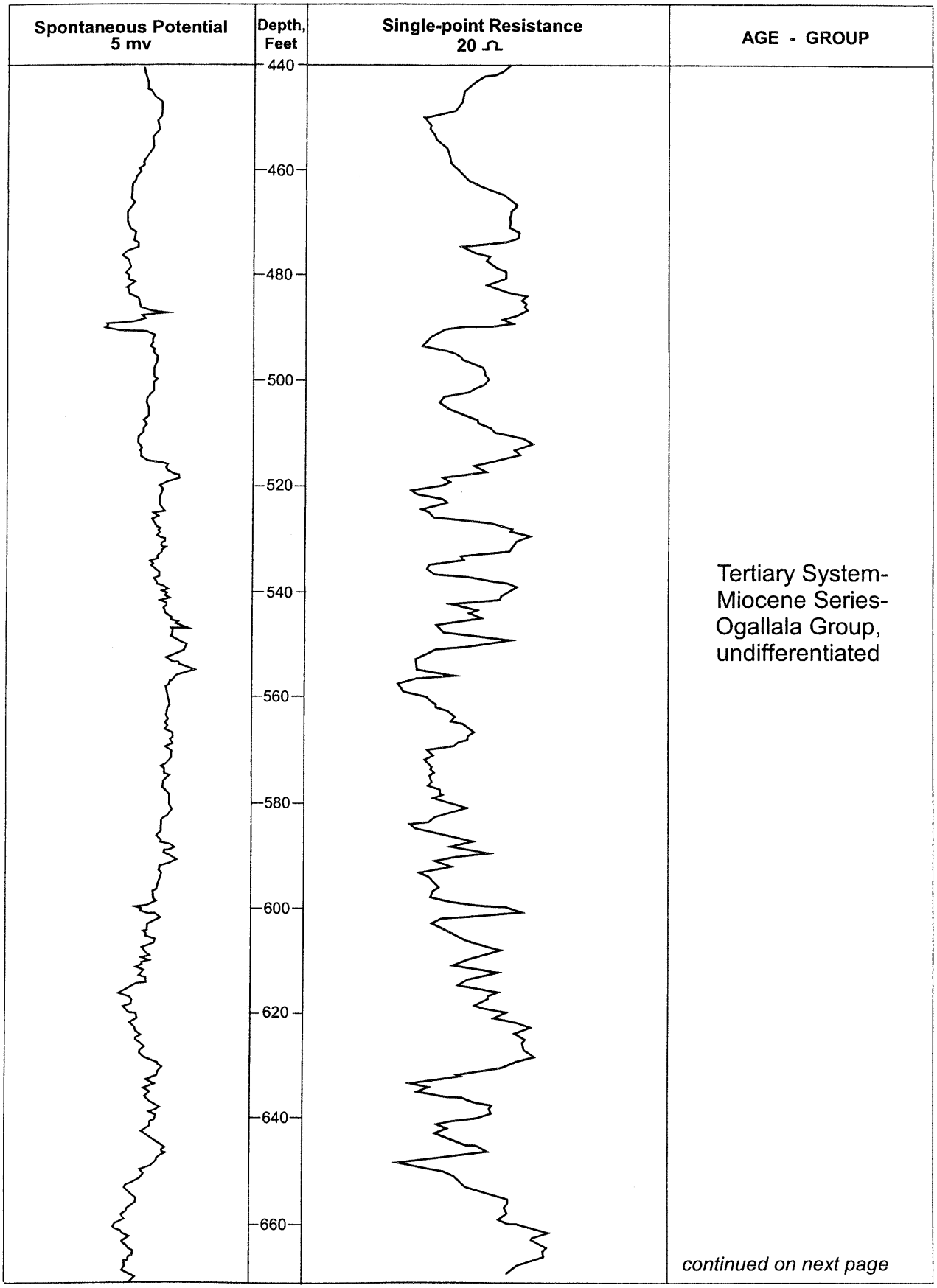
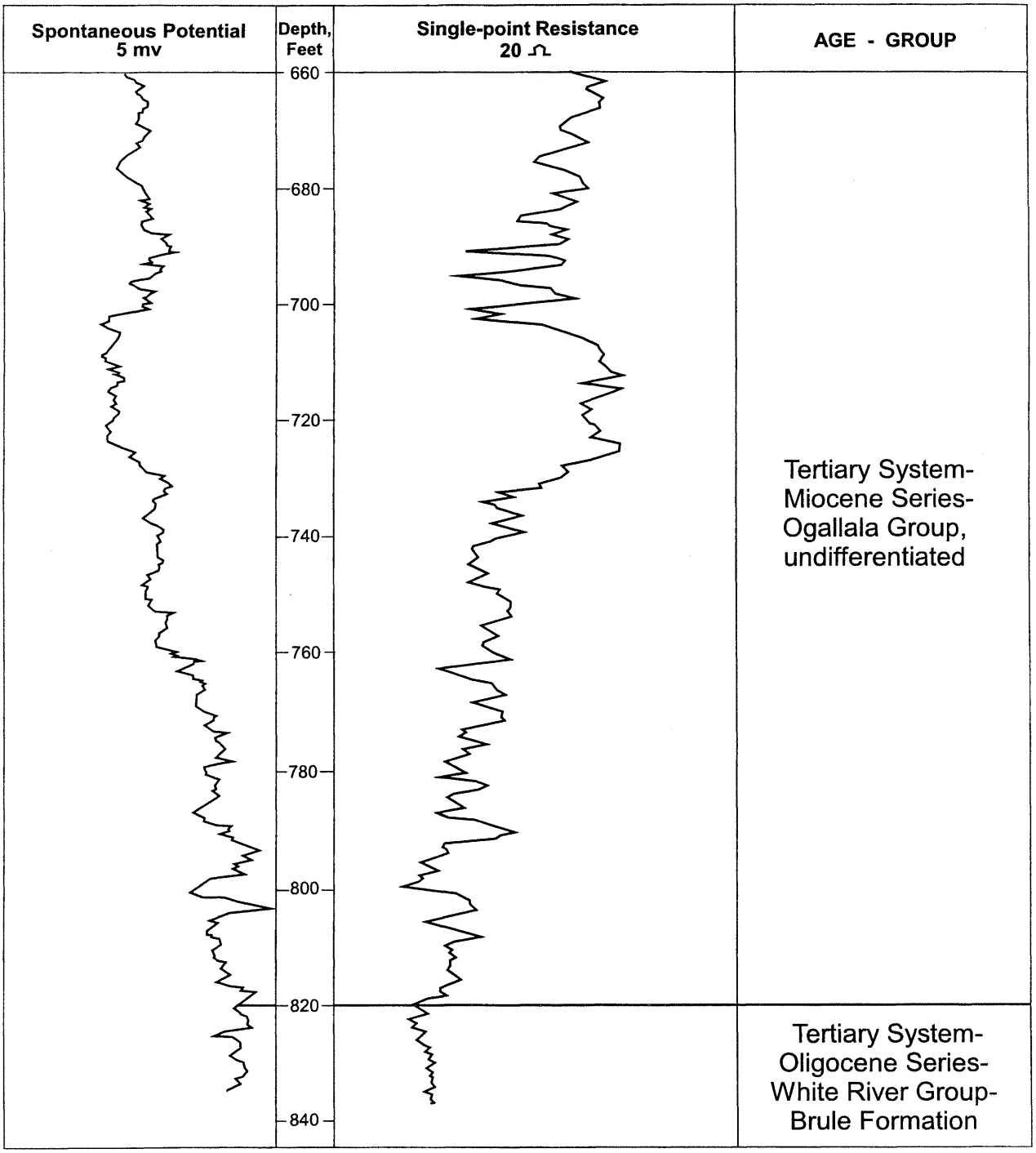


Figure 2 continued. McPherson County sample geophysical logs (8-S-82)



The method whereby the elevation of the land surface at test hole sites was determined is indicated in the heading of each log, as follows: a = altimeter, h = hand leveling, i = spirit leveling, t = estimated from topographic map.

The test-hole records accurately reflect subsurface conditions only at the locations where the test holes were drilled. Interpretive data reflecting probable subsurface conditions between test holes are being compiled for publication in county reports and are available for inspection in the offices of the Conservation and Survey Division.

Each test hole is identified by a number assigned in the field (for example #36-C-81, #254-34), and also is identified by a number indicating its location within the land divisions of the U.S. Bureau of Land Management's survey of Nebraska. Location numbers of test holes east of the 6th principal meridian, which passes through Columbus in a north-south direction, are preceded by the capital letter A; those west of the principal meridian have no preceding letter. The first numeral indicates the township, the second the range, and the third the section. As shown in figure 3, the letters that follow the section number indicate the location of the test hole within the section, the first letter indicating the quarter section and the second letter indicating the quarter-quarter section and so on to the quarter-quarter-quarter-quarter section. The letters A, B, C, and D are applied in counterclockwise direction beginning with A in the northeast quadrant. The last numeral is the serial number of the test hole within the quarter-quarter-quarter-quarter section if more than one well is present in that area. Figure 3 also shows the equivalent relationship between this system and the one used more commonly in Nebraska by citizens and many governmental units.

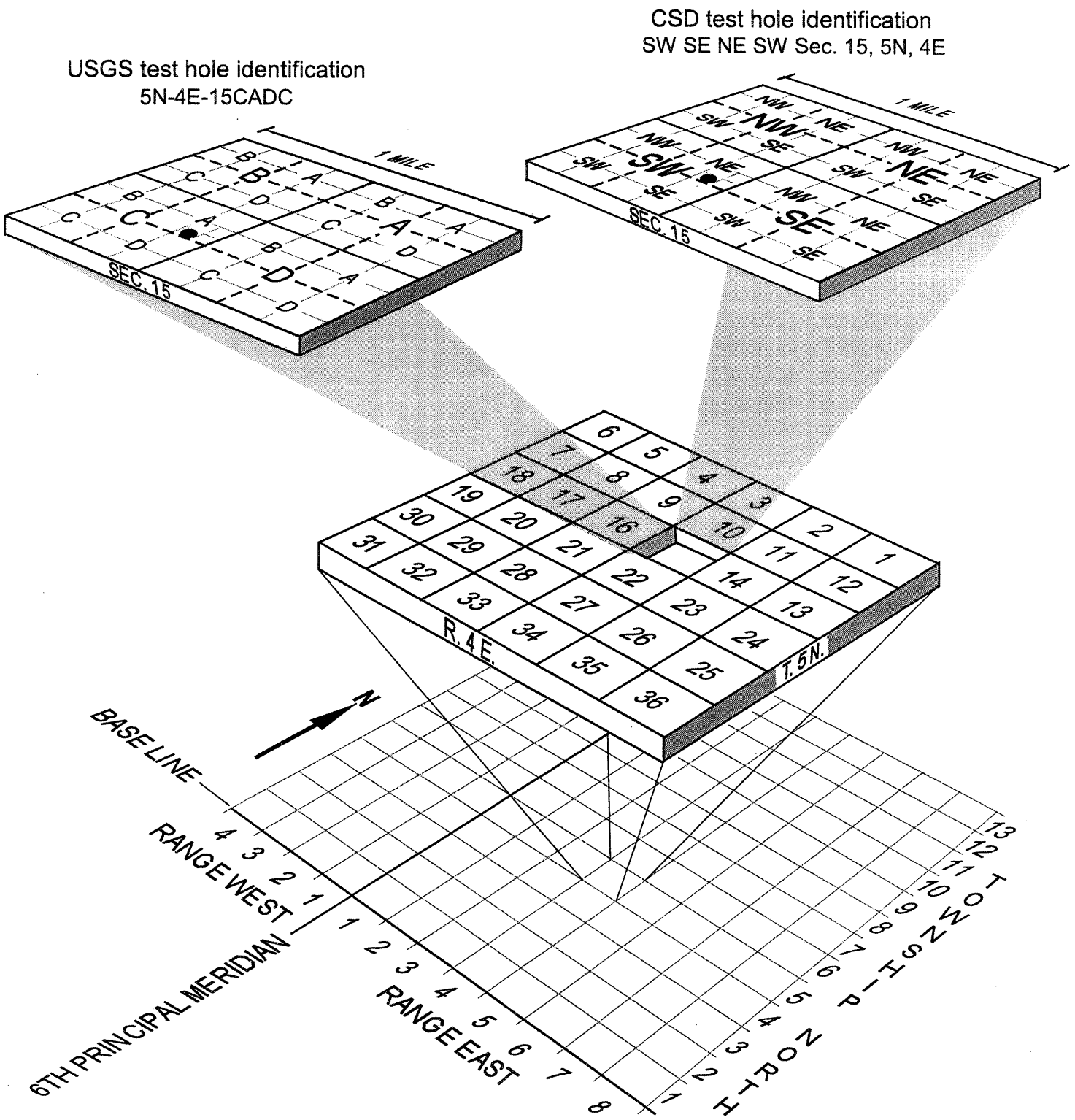


Fig. 3. System for identifying test-hole according to its location.

SELECTED REFERENCES

A few of the most recently published references to geology, soil, and groundwater resources of McPherson County are included below. The interested reader may find citations in these references to earlier published studies.

Bleed, A.S. and C.A. Flowerday (editors), 1998, An atlas of the Sand Hills: University of Nebraska, University of Nebraska, Conservation and Survey Division, Resource Atlas 5b, 260 p.

Diffendal, R.F., Jr., 1991, Geologic map showing configuration of the bedrock surface, North Platte 1° x 2° quadrangle, Nebraska: U.S. Geological Survey, Miscellaneous Investigations Map I-2277, 1 sheet, scale 1:250,000.

Ginsberg, M. H., 1985, Nebraska's Sandhills lakes, a hydrogeologic overview: Water Resources Bulletin, v.21, no. 4, p. 573-578.

Ginsberg, M. H., 1987, Water-budget model of the south-central Sand Hills of Nebraska: University of Nebraska-Lincoln, Ph.D. dissertation.

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Sherfey, L. E., 1969, Soil Survey of McPherson County, Nebraska: U.S. Department of Agriculture, Soil Conservation Service, in cooperation with University of Nebraska Conservation and Survey Division, 35p. + 34 maps.

Swinehart, J. B. and others (compilers) and G.M. Richmond (Editor), 1994, Quaternary geologic map of the Platte River 4°x6° quadrangle, United States: U.S. Geological Survey Miscellaneous Investigations Map I-1420, 1 sheet, scale 1:1,000,000.

McPherson County
Test-Hole Logs Table of Contents

Test-holes are arranged in this publication by township, range and section.

McPherson County
Test-Hole Logs Table of Contents
Arranged by year drilled, test-hole number.

1982

1983

1985

1987

2002

Test Hole #37-HP-78 (E-logs)
(17N-30W-1aaaa)
McPherson County

Location: NE NE NE NE sec. 1, T. 17 N., R. 30 W., 91 ft. south and 36 ft. west of northeast corner.
Ground elevation: 3,035 ft. (t). (Stapleton NW 7.5 min. quadrangle).
Depth to water: 50 ft. (11-14-78)
Total Depth: 710 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to medium, moderately silty, brown..	0.0	50.0
Sand, very fine to medium, slightly to moderately silty, brown to pale yellow.....	50.0	90.0
Silt and sand, interbedded sand, silt is slightly sandy and moderately clayey, pale yellow, sand is very fine to medium, moderately silty, rare rootlets and sandstone fragments.....	90.0	212.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, very fine to very coarse sand to medium gravel, much coarse to very coarse sand, silt to siltstone lenses at 231, 270, 391, 305, 323, and 340 feet.....	212.0	358.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Silt, very clayey, red brown.....	358.0	363.0
Sand, very fine to medium with interbedded silt and siltstone seams, pale brown.....	363.0	439.0
Siltstone with interbedded sand seams, sand is very fine to medium, silt is in part limy with lime cement, pale brown to pale yellow to white.....	439.0	448.0
Sand to sandstone, very fine to medium, trace siltstone, pale brown to pale olive.....	448.0	466.0
Sandstone to sand, very fine to medium, slightly to moderately silty with siltstone, trace rootlets, pale brown to pale olive.....	466.0	497.0
Sand to sandstone, very fine to medium, trace rootlets, trace siltstone, pale brown to pale olive.....	497.0	536.0
Sandstone to sand, very fine to medium, moderately to very silty, thin limy lenses and siltstone lenses, pale brown to pale olive.....	536.0	570.0
Siltstone with interbedded sands and sandstones, very fine to coarse, much fine to medium, in part lime cemented, pale brown.....	570.0	630.0
Sandstone, very fine to fine, brown.....	630.0	638.0

Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, slightly sandy, very fine to medium, traces of lime and lime cement, light red brown...	638.0	710.0

Test Hole #6-S-82 (E-logs)
(17N-31W-3dccd)
McPherson County

Location: SE SW SW SE sec. 3, T. 17 N., R. 31 W., 128 ft. north and 2,180 ft. west of southeast corner.
Ground elevation: 3,170 ft. (t). (North Platte 2 NW 7.5 min.) quadrangle).
Depth to water: Not measured.
Total depth: 760 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, slightly silty, brown.....	0.0	29.0
Clay, silty with trace sand, blue green.....	29.0	42.0
Sand, very fine to fine, trace medium to coarse, slightly silty, gray to brown.....	42.0	61.0
Silt, moderately clayey, slightly sandy, greenish gray.....	61.0	65.0
Sand, very fine to medium, interbedded green silts, gray.....	65.0	105.0
Silt, slightly to moderately, sandy, very fine to fine, pale olive.....	105.0	125.0
Sand, very fine to fine, moderately silty, olive....	125.0	136.0
Silt, slightly to moderately sandy, very fine to fine, olive.....	136.0	142.0
Sand, very fine to fine, trace medium to coarse, moderately silty, olive.....	142.0	246.0
Sand, very fine to fine, trace medium to coarse, moderately to very silty, olive.....	246.0	275.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, fine sand to fine gravel, granitic.	275.0	281.0
Sand, very fine to medium, moderately to very silty, trace sandstone, brown.....	281.0	305.0
Sand and gravel, fine sand to fine gravel, granitic.	305.0	320.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Silt to siltstone, very sandy, lime cemented streaks, trace volcanic ash 335 to 340 feet, yellow to brown.....	320.0	343.0
Sand and gravel, fine sand to fine gravel.....	343.0	350.0
Siltstone and slit, moderately sandy, very fine, yellow to brown.....	350.0	355.0
Sand and gravel, fine sand to fine gravel, trace medium to coarse gravel, silt 385 to 390 feet.....	355.0	413.0
Sand, very fine to coarse, slightly silty, rootlets, trace lime cement.....	413.0	459.0

Sandy, very fine to medium, moderately silty, limey to lime cemented, pale to very pale brown.....	459.0	473.0
Sand, very fine to medium, trace coarse, slightly to moderately silty, trace lime cement, olive gray...	473.0	500.0
Sandstone, very fine to fine, trace medium to coarse, silt, in part cemented, olive gray.....	500.0	508.0
Siltstone, moderately sandy, very fine to medium sand, gray to olive brown.....	508.0	518.0
Sand to sandstone, very fine to coarse, slightly to moderately silty, in part lime cemented, grayish brown.....	518.0	622.0
Siltstone, moderately sandy, pale olive.....	622.0	625.0
Sand to sandstone, very coarse, moderately silty, lime cemented, pale olive.....	625.0	655.0
Silt to siltstone, in part limy, brown to olive yellow.....	655.0	735.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone to silt, brown.....	735.0	760.0

Test Hole #91-HP-80 (E-logs)
(17N-33W-30cbcc)
McPherson County

Location: SW SW NW SW sec. 30, T. 17 N., R. 33 W., 1,454.5 ft. north and 52.0 ft. east of southwest corner.
Ground elevation: 3,210 ft. (t). (Tin Camp Ranch 7.5 min. quadrangle).
Depth to water: Not measured.
Total depth: 580 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, very silty, slightly to moderately clayey, grayish brown.....	0.0	40.0
Sand, very fine to fine, trace medium, gray.....	40.0	107.0
Sand, very fine to medium, trace coarse to very coarse, with interbedded blue gray, silty clay seams, gray.....	107.0	144.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, fine sand to medium gravel, trace very coarse gravel, much very coarse sand to fine gravel.....	144.0	162.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Silt, moderately clayey, moderately sandy, brown....	162.0	178.0
Sand, very fine to fine, trace medium, slightly silty, grayish brown.....	178.0	187.0
Silt, slightly to moderately clayey, grayish brown..	187.0	189.0
Sand, very fine to very coarse, trace fine gravel, sandstone seams, grayish brown.....	189.0	225.0
Silt, very sandy, with interbedded silty sand and sandstone, rootlets, yellow brown.....	225.0	246.0
Sand to sandstone, very fine to medium, rootlets, slightly silty, grayish brown.....	246.0	274.0
Silt, moderately to very clayey, limy, ashy, gray...	274.0	277.0
Sand, very fine to fine, trace medium to coarse, in part ashy, brown.....	277.0	310.0
Sand to sandstone, very fine to fine with interbedded silt, limy, pale grayish brown.....	310.0	348.0
Sand, very fine to medium, trace coarse to very coarse, slightly silty.....	348.0	357.0
Sandstone, very fine to medium, trace coarse, moderately silty with interbedded silt seams, trace rootlets, gray brown.....	357.0	376.0
Sand, very fine to coarse, trace very coarse sand and fine gravel, slightly silty, trace rootlets, grayish brown.....	376.0	400.0

Clay, olive.....	400.0	402.0
Sand, very fine to coarse, trace very coarse, in part slightly silty, grayish brown.....	402.0	505.0
Sand, very fine to fine, slightly silty, grayish brown.....	505.0	535.0
Silt, moderately to very sandy, slightly clayey, moderately to very limy, pale brown.....	535.0	556.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, clayey, reddish brown.....	556.0	580.0

Test Hole #3-B-85 (E-log)
(17N-34W-2ddcd)
McPherson County

Location: SE SW SE SE sec. 2, T. 17 N., R. 34 W., 50 ft. north and 770 ft. west of southeast corner.
Ground elevation: 3,285 ft. (t). (Tin Camp Ranch 7.5 min. quadrangle).
Depth to water: 114.6 ft. (9-6-85).
Total depth: 160 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, well sorted, moderately silty, grayish brown.....	0.0	10.0
Sand, very fine to fine, slightly silty, pale brown.	10.0	62.0
Sand, fine to coarse, trace very coarse, brown.....	62.0	72.0
Sand, very fine to medium, rare coarse, slightly silty, grayish brown.....	72.0	85.0
Sand, very fine to coarse, rare very coarse, light gray brown.....	85.0	120.0
Sand, very fine to fine, slightly to moderately silty, gray to pale olive gray.....	120.0	135.0
Sand, very fine to fine, organic rich, collected for radiocarbon dating, dark gray.....	135.0	141.0
Sand, very fine to medium, slightly silty, gray.....	141.0	158.5
Silt, slightly to moderately clayey, gray green.....	158.5	160.0

Test Hole #92-HP-80 (E-logs)
(17N-35W-21abbc)
McPherson County

Location: SW NW NW NE sec. 21, T. 17 N., R. 35 W., 574 ft. south and approximately 2,220 ft. west of northeast corner.
Ground elevation: 3,379 ft. (Big Bald Hill NE 7.5 min. quadrangle).
Depth to water: Not measured.
Total Depth: 660 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Top soil, silt, very sandy, slightly clayey, dark brown.....	0.0	2.0
Sand, very fine to fine, very silty, slightly clayey, dark brown.....	2.0	5.0
Silt, very sandy, very fine to fine, slightly clayey, grayish brown.....	5.0	15.0
Sand, very fine to medium, trace coarse, in part slightly to moderately silty, greenish gray.....	15.0	80.0
Sand, very fine to fine, moderately silty, slightly clayey, greenish gray.....	80.0	102.0
Silt, very sandy, slightly clayey, gray.....	102.0	123.0
Sand, very fine to fine, with interbedded silt, slightly clayey, gray.....	123.0	158.0
Sand, very fine to fine, moderately to very silty, slightly clayey, gray.....	158.0	184.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, very fine sand to fine gravel, trace medium to coarse gravel, much coarse to very coarse sand.....	184.0	207.0
Sand to sandstone, very fine to fine, very silty, rootlets, grayish brown.....	207.0	221.0
Sand and gravel, very fine sand to fine gravel, trace medium gravel, much coarse to very coarse sand.....	221.0	243.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Silt, very sandy, very fine to fine, trace medium greenish gray.....	243.0	256.0
Sand to sandstone, very fine to fine, trace medium, clayey, silt seams, greenish gray to gray.....	256.0	282.0
Silt, moderately clayey, slightly to moderately sandy, very fine to fine, gray.....	282.0	286.0
Sand to sandstone, very fine to fine, trace medium, slightly silty, interbedded sandy silt lenses, slightly clayey, gray.....	286.0	308.0

Silt, slightly to moderately clayey, moderately to very sandy, gray	308.0	310.0
Sand to sandstone, very fine to coarse, slightly silty, grayish brown	310.0	383.0
Silt to siltstone, sandy, trace volcanic ash, grayish brown	383.0	390.0
Volcanic ash, gray	390.0	395.0
Silt, moderately clayey, moderately to very sandy, very fine to fine, grayish brown	395.0	412.0
Sand, very fine to medium, trace coarse to very coarse, rootlets, slightly silty, grayish brown	412.0	424.0
Silt, slightly to moderately clayey, moderately sandy, very fine to fine, grayish brown	424.0	426.0
Sand, very fine to medium, trace coarse to very coarse, trace sandstone, trace rootlets, grayish brown	426.0	480.0
Silt to siltstone with interbedded sand, silt is sandy, very fine to fine, olive	480.0	502.0
Sand, very fine to medium, slightly silty, grayish brown	502.0	510.0
Silt to siltstone, moderately sandy, very fine to medium, slightly clayey, olive	510.0	520.0
Sand, very fine to medium, trace coarse to very coarse, slightly to moderately silty, grayish brown	520.0	529.0
Sand, very fine to coarse, trace very coarse, grayish brown	529.0	566.0
Sand to sandstone, very fine to medium, moderately silty, interbedded siltstone seams, grayish brown.	566.0	596.0
Sand to sandstone, very fine to medium, slightly to moderately silty, lime cemented, grayish brown	596.0	624.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Silt to slitstone, clayey, in part limy, reddish brown	624.0	660.0

Test Hole #254-34
(18N-31W-16dd)
McPherson County

Location: SE SE sec. 16, T. 18 N., R. 31 W.
Ground elevation: 3,233 ft. (t). (Tryon 7.5 min. quadrangle).
Depth to water: 106.1 ft. (11-26-34).
Total Depth: 120 ft.

	Depth, in feet	
	From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand; fine texture.....	0.0	8.0
Sand; very fine texture.....	8.0	58.0
Silt and sand; very fine texture.....	58.0	63.5
Sand; fine texture.....	63.5	73.0
Sand; medium texture.....	73.0	80.0
Silt and sand; very fine texture.....	80.0	95.0
Silt, clayey; iron-stained.....	95.0	98.0
Sand; medium texture.....	98.0	120.0

Test Hole #35-B-71 (E-logs)
(18N-32W-1cccd)
McPherson County

Location: SE SW SW SW sec. 1, T. 18 N., R. 32 W., 239 ft. north and 423 ft. east of southwest corner.
Ground elevation: 3,240 ft. (t). (Tryon 7.5 min. quadrangle).
Depth to water: Not measured.
Total depth: 800 ft.

	Depth, in feet	
	From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Silt, moderately to very sandy, very fine to fine, brown	0.0	8.0
Sand, very fine to medium, moderately to very silty, light brown	8.0	21.0
Sand, very fine to medium, trace coarse, light brown	21.0	26.0
Sand, very fine to medium, moderately silty, light brown	26.0	50.0
Sand, very fine to medium, light brown	50.0	56.0
Sand, very fine to medium, in part moderately silty, light brown	56.0	79.0
Silt, moderately clayey, slightly sandy, very fine to fine, pale yellow	79.0	89.0
Sand, very fine to medium, light brown	89.0	100.0
Sand, very fine to medium, much fine, slightly to moderately silty, silty seams, trace snail shells, light brown	100.0	226.0
Tertiary System - Ogallala Group, undifferentiated:		
Silt, moderately clayey, very sandy, very fine to medium, limy, light gray to white	226.0	238.0
Sand to sandstone, very fine to coarse, trace very coarse, slightly to moderately silty in places, rootlets, light brown	238.0	250.0
Silt, moderately to very clayey, very sandy, very fine to very coarse, trace rootlets, light brown	250.0	256.0
Sand and gravel, fine sand to medium gravel, granitic	256.0	272.0
Silt, slightly to moderately clayey, slightly to moderately sandy, very fine, light gray	272.0	276.0
Sand, fine to very coarse, slightly to moderately silty, rootlets, pale brown	276.0	280.0
Sandstone to sand, very fine to medium, in part lime cemented, many rootlets, pale brown to reddish brown	280.0	296.0

Silt, slightly to moderately sandy, very fine to fine, slightly to moderately clayey, reddish brown with light	296.0	305.0
Sandstone, very fine to fine, clayey silt seams, many rootlets, reddish brown and olive	305.0	330.0
Sand to sandstone, very fine to fine, in part lime cemented, rootlets, brown to olive	330.0	385.0
Sandstone to sand, very fine to fine, trace medium, slightly silty, in part moderately limy, brown to olive	385.0	488.0
Sandstone to sand, very fine to fine, trace medium, rootlets, moderately silty, light brown to light olive brown	488.0	550.0
Sandstone, very fine to fine, very limy, white	550.0	553.0
Sandstone to sand, very fine to fine, trace medium, trace rootlets, moderately silty, light brown to brown	553.0	604.0
Sand, very fine to medium, much medium, light brown.	604.0	620.0
Silt, very sandy, very fine to medium, very pale olive	620.0	628.0
Sand, very fine to medium, trace coarse, trace red silt, brown	628.0	644.0
Sand, very fine to very coarse, much medium to coarse, trace rootlets	644.0	666.0
Interbedded sand, very fine to very coarse, much medium to coarse, trace fine gravel and silt, moderately clayey, trace rootlets, pale olive	666.0	680.0
Sand, very fine to coarse, much medium brown	680.0	750.0
Silt, very sandy, very fine to fine, slightly to moderately clayey, light brown	750.0	752.0
Sand, very fine to medium, trace rootlets, brown	752.0	759.0
Sand, very fine to medium, slightly to moderately silty, brown to light brown to white	759.0	765.0
Sand, very fine to medium, slightly silty, brown	765.0	771.0
Silt, moderately to very sandy, very fine to medium, pale brown to pale olive	771.0	779.0
Sand, very fine to medium, trace coarse to very coarse, slightly silty	779.0	786.0
Silt, moderately sandy, very fine to fine, very pale olive	786.0	790.0
Sand, very fine to medium, moderately silty, brown..	790.0	800.0

Test Hole #M-01-02
(18N-33W-6cabc)
McPherson County

Location: SW NW NE SW sec. 6, T. 18 N., R. 33 W., approximately 2250 ft north of south section line and 1600 ft east of west section line.
Source Footage: Field
Latitude: 41 33 36N
Longitude: 101 10 11W
Source Lat/Long: GPS (DNR)
7.5-minute Quad Map Name: Snyder Lake
Ground elevation: 3326.8 ft
Source elev: GPS (DNR)
Depth to water: Unknown
Date measured: Unknown
Geophysical Log(s): Yes

	Depth, in feet From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, slightly silty, pale brown to brown	0.0	19.0
Silt, slightly to moderately clayey, slightly sandy, fine to medium sand, light olive brown	19.0	65.0
Sand, fine to coarse, brown	65.0	72.0
Silt, clayey, iron stains, Paleosol, black to dark greenish gray	72.0	78.0
Sand, medium to coarse, greenish gray	78.0	92.0
Silt, clayey, slightly sandy, very fine to fine sand, greenish gray	92.0	125.0
Sand, fine to medium, slightly silty, greenish gray.	125.0	146.0
Silt, moderately to very sandy, fine to medium sand, greenish gray	146.0	163.0
Silt, moderately sandy, fine to medium sand, brown to gray	163.0	172.0
Sand, fine to medium, in part moderately silty, grayish brown	172.0	215.0
Silt, slightly sandy, fine to medium sand, reddish brown	215.0	240.0
Sand and gravel, medium sand to medium gravel, much fine gravel	240.0	251.0
Tertiary System - Miocene Series - Ogallala Group:		
Ash Hollow Formation:		
Silt, moderately clayey, possible volcanic ash, grayish white	251.0	260.0
Silt, moderately clayey, grayish white to reddish brown	260.0	278.0

Sandstone, very fine to medium sand, slightly silty, brown to reddish brown.....	278.0	300.0
Sandstone, very fine to medium, hackberry seed fragments and siliceous rootlets, trace of white clayey silt, reddish brown.....	300.0	313.0
Sand to sandstone, fine to medium sand, some interbedded white silt to siltstone, brown.....	313.0	331.0
Sandstone, very fine to medium sand, brown, interbedded with white siltstone.....	331.0	368.0
Sand, fine to coarse, brown.....	368.0	389.0
Sandstone, very fine to medium sand, in part cemented, olive green to white.....	389.0	402.0
Sand to sandstone, fine to medium sand, brown.....	402.0	426.0
Sandstone, fine to medium sand, moderately silty, in part cemented and calcareous, brown and white..	426.0	510.0
Sand to sandstone, very fine to medium sand, trace coarse, in part silty and cemented, olive to white.....	510.0	560.0
Sandstone to sand, fine to medium sand, rare fine gravel, trace siliceous rootlets, in part moderately silty and clayey, light olive brown....	560.0	590.0
Sand, medium to coarse, trace rootlets, occasional olive siltstone seam.....	590.0	655.0
Sandstone, fine to medium sand, trace olive siltstone, slightly silty, olive gray.....	655.0	669.0
Sand, medium to very coarse with trace of olive gray sandstone, fine to medium sand.....	669.0	682.0
Sandstone, fine to medium sand, olive gray with olive to pale brown calcareous siltstone.....	682.0	695.0
Sand, medium to very coarse with sandstone and siltstone fragments, olive.....	695.0	705.0
Sand to sandstone, medium to very coarse sand, moderately calcareous, occasional hackberry seed and rootlet, olive to pale olive.....	705.0	721.0
Sand, to sand and gravel, medium to very coarse sand and fine gravel.....	721.0	775.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, brown.....	775.0	800.0

Test Hole #10-S-82 (E-logs)
(18N-35W-36ddda)
McPherson County

Location: NE SE SE SE sec. 36, T. 18 N., R. 35 W., 450 ft. north and 240 ft. west of southeast corner.
Ground elevation: 3,348 ft. (t). (Big Bald Hill NE 7.5 min. quadrangle)
Depth to water: Not measured.
Total depth: 720 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, slightly silty, gray brown to olive	0.0	64.0
Silt, very sandy, very fine to fine sand, olive	64.0	70.0
Sand, very fine to fine, slightly to moderately silty, especially at 85 feet, gray to pale olive	70.0	111.0
Sand, very silty, very fine to fine sand, green to olive	111.0	121.0
Sand, very fine to fine, slightly silty, olive brown	121.0	180.0
Sand, very fine to very coarse, rootlets	180.0	185.0
Silt, very sandy, green and brown	185.0	189.0
Sand and gravel, fine sand to fine gravel	189.0	224.0
Sand, very fine to very coarse, slightly silty	224.0	237.0
Silt, brown, sand and gravel seam 241 to 244 ft.	237.0	254.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, fine sand to fine gravel, trace medium gravel, trace silt seams	254.0	335.0
Tertiary - Miocene Series - Ogallala Group, undifferentiated:		
Sand to sandstone, very fine to fine, rootlets, pale olive to olive yellow	335.0	400.0
Sand to sandstone, lime cemented, slightly to moderately silty, rootlets, pale brown	400.0	420.0
Sand to sandstone, slightly silty, olive	420.0	440.0
Silt, brown	440.0	444.0
Sand to sandstone, very fine to fine, moderately silty, brown and olive	444.0	463.0
Silt, moderately sandy, pale olive	463.0	468.0
Sand to sandstone, moderately silty, sandier 485 to 486 ft., brown to olive	468.0	487.0
Sand to sandstone, very fine to fine, slightly silty, olive	487.0	525.0
Sand to sandstone, lime cemented, rootlets, pale olive	525.0	588.0

Sand to sandstone, moderately to very silty with brown and olive siltstone and claystone, moderately limy, light yellow brown to pale olive.	588.0	626.0
Sand to sandstone, slightly silty, pale brown.....	626.0	658.0
Silt, moderately sandy, moderately limy, olive and reddish brown.....	658.0	664.0
Sand to sandstone, slightly silty, slightly limy, brown to pale brown.....	664.0	675.0
Sand to sandstone, moderately silty, very limy to lime cemented, pale brown.....	675.0	690.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Sand, moderately silty, slightly limy, brown and green.....	690.0	694.0
Silt to siltstone, reddish brown.....	694.0	720.0

Test Hole #39B-HP-79 (E-logs)
(19N-30W-33acaa)
McPherson County

Location: NE NE SW NE sec. 33, T. 19 N., R. 30 W., 1,380 ft. south and 1,375 ft. west of northeast corner.
Ground elevation: 3,180 ft. (t). (Ringgold 7.5 min. quadrangle).
Depth to water: Not measured.
Total depth: 870 ft.

	Depth, in feet	
	From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to medium, gray brown.....	0.0	16.0
Silt, moderately to very clayey, trace iron stain, in part sandy, pale olive.....	16.0	74.0
Sand, very fine to medium, silty, gray brown.....	74.0	78.0
Silt, very clayey, moderately to very sandy, very fine to medium, yellow brown.....	78.0	98.0
Sand, very fine to medium, trace coarse, slightly to moderately silty, light olive gray.....	98.0	124.0
Silt, moderately clayey with interbedded sand seams, very fine to fine, in part very limy, pale brown to pale yellow brown.....	124.0	147.0
Sand, very fine to medium, trace coarse, light brownish gray.....	147.0	161.0
Silt, moderately clayey, moderately sandy, very fine, light brownish gray.....	161.0	168.0
Sand, very fine to fine, moderately silty, light brownish gray to pale olive.....	168.0	180.0
Silt, moderately clayey, pale olive.....	180.0	185.0
Sand, very fine to fine, slightly to moderately silty.....	185.0	214.0
Silt, moderately to very clayey, moderately sandy, very fine to fine, light gray.....	214.0	220.0
Sand, very fine to fine, trace medium, moderately silty, brown.....	220.0	238.0
Silt, moderately to very clayey, moderately sandy, very fine to medium, light to brownish gray.....	238.0	252.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, fine to very coarse sand and fine to medium gravel, silt seam 280 to 282 ft.....	252.0	300.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Sandstone to sand, very fine to fine, very silty, moderately clayey, light olive gray.....	300.0	339.0
Sand to sandstone, very fine to medium, slightly to moderately silty, light brownish gray.....	339.0	351.0

Sandstone, very fine to medium, very silty, lime cemented, rootlets, pale brown.....	351.0	357.0
Sand to sandstone, very fine to medium, trace coarse, slightly to moderately silty, in part limy, rootlets, light brownish gray.....	357.0	410.0
Sandstone, very fine to medium, moderately to very silty, moderately to very clayey, in part very limy, rootlets, light gray.....	410.0	483.0
Silt, very sandy, very fine to medium, with sandstone and sand seams, slightly limy, pale olive.....	483.0	552.0
Sand to sandstone, very fine to medium, trace coarse sand to fine gravel, in part silty and slightly limy, pale yellow to pale olive.....	552.0	638.0
Clay to claystone, moderately silty, in part limy, pale yellow.....	638.0	666.0
Sand to sandstone, very fine to medium, trace coarse to very coarse, light gray brown.....	666.0	682.0
Silt to slitstone, moderately to very clayey, moderately sandy, rootlets, pale olive.....	682.0	702.0
Sand to sandstone, very fine to fine,, pale olive...	702.0	706.0
Slit to slitstone, moderately to very clayey, moderately sandy, very fine to fine, pale yellow to pale olive.....	706.0	744.0
Sand to sandstone, very fine to fine, pale olive....	744.0	747.0
Silt to siltstone, moderately to very clayey, pale olive.....	747.0	762.0
Sand to sandstone, very fine to fine, slightly to moderately silty, pale olive.....	762.0	769.0
Slit to siltstone, moderately to very clayey with claystone, pale olive.....	769.0	773.0
Sand to sandstone, very fine to fine, moderately silty, pale olive.....	773.0	778.0
Clay to claystone, moderately to very silty, moderately sandy, very fine to fine, pale olive...	778.0	783.0
Sand to sandstone, very fine to fine, slightly to moderately silty, pale olive.....	783.0	790.0
Clay to claystone, moderately to very silty, pale olive to brown.....	790.0	808.0
Sand to sandstone, very fine to fine, very silty, brown.....	808.0	810.0
Silt to siltstone, very clayey, pale olive to pale yellow.....	810.0	822.0
Sand to sandstone, very fine to medium, moderately to very silty, moderately clayey, pale olive to pale yellow.....	822.0	826.0
Claystone to siltstone, in part limy, olive to brown.....	826.0	844.0

Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, trace claystone, in part limy, brown to dark brown.....	844.0	870.0

Test Hole #1-B-72 (E-logs)
(19N-31W-2bbad)
McPherson County

Location: SE NE NW NW sec. 2, T. 19 N., R. 31 W., 330 ft. south and 1,252 ft. east of northwest corner.
Ground elevation: 3,204 ft. (t). (Tryon NE 7.5 min. quadrangle).
Depth to water: 81 ft. (5-5-80).
Total depth: 600 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Top soil, silty, moderately to very sandy, very fine sand, very dark brown to gray.....	0.0	1.5
Sand, very fine, moderately silty, slightly clayey, brown.....	1.5	8.6
Silt, slightly to moderately clayey, slightly sandy, very fine sand, dark grayish brown with interbedded pale brown.....	8.6	16.5
Sand, very fine to fine, with thin interbedded silt lenses, trace medium to coarse sand 45 to 56.5 ft., brown.....	16.5	60.0
Silt, moderately to very sandy, very fine sand, trace shell fragments, moderately to very limy, pale gray to pale olive gray.....	60.0	76.0
Sand, very fine to fine, much fine, brown.....	76.0	80.0
Interbedded sand and silt, very fine sand, shell fragments, trace iron stain, brown to light olive gray.....	80.0	102.5
Sand, very fine to fine, trace medium to coarse, slightly silty, trace shell fragments, brown.....	102.5	121.3
Silt, slightly sandy, very fine to medium sand, slightly clayey, very limy, shell fragments, trace iron stain, pale gray brown to pale olive gray to white.....	121.3	131.0
Sand, very fine to medium, trace coarse, brown.....	131.0	150.0
Silt, very sandy, fine to medium sand, many shell fragments, pale olive.....	150.0	162.0
Sand, very fine to medium, much fine, with interbedded pale olive silts, brown.....	162.0	196.0
Sand, very fine to medium, moderately silty with trace of iron staining and shell fragments, pale olive gray to brown.....	196.0	230.0
Silt, slightly to moderately silty, limy, trace of iron staining, pale olive gray to olive gray.....	230.0	240.4
Sand, fine to medium, slightly silty, brown.....	240.4	250.0

Silt, with interbedded sand, sand very fine to fine with trace of coarse sand to fine gravel 255 to 270.5 ft., thin limy, cemented areas, olive to pale brown	250.0	270.5
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, coarse sand to medium gravel, much fine gravel	270.5	288.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Sandstone, very fine to fine sand, slightly silty, moderately consolidated, many siliceous rootlets, olive	288.0	298.0
Silt, moderately to very sandy, very fine to fine sand, trace of iron stain, thin olive siltstone seams, olive	298.0	310.0
Sandstone, with interbedded pale olive brown silt to siltstone, trace of rootlets and hackberry seed fragments, olive	310.0	325.0
Silt, very clayey, in part siltstone with siliceous nodules, pale yellow	325.0	328.0
Sand and sandstone, fine to coarse sand, much coarse, rootlets, seed fragments, pale olive to olive	328.0	342.0
Sandstone, fine to medium sand, moderately silty, pale olive to olive brown	342.0	350.0
Silt to siltstone, very slightly sandy, pale yellow.	350.0	353.0
Sand to sandstone, fine to medium, trace rootlets, brown	353.0	366.0
Sand to sandstone, very fine to medium, trace of coarse, rootlets, pale olive to olive to light gray	366.0	392.0
Sand, very fine to medium, trace of coarse, rootlets, olive to light gray	392.0	450.0
Sand to sandstone, very fine to coarse, slightly silty, rootlets, olive to light gray	450.0	485.0
Sand to sandstone, very fine to medium, slightly to moderately silty, limy, light olive gray	485.0	500.0
Sand, very fine to medium, thin interbedded silt lenses, some rootlets, olive gray	500.0	526.0
Sand, very fine to medium, moderately to very silty, olive gray	526.0	540.0
Sand, very fine to medium, rare coarse, with sandy silt lenses, rootlets, olive	540.0	565.0
Sand, very fine to fine, moderately to very silty, trace of rootlets, olive	565.0	570.0

Sand to sandstone, very fine to medium, slightly silty, trace of rootlets, olive.....	570.0	590.0
Sand to sandstone, very fine to medium, trace of coarse to very coarse, trace siltstone fragments, light olive gray.....	590.0	600.0

Test Hole #8-S-82 (E-logs)
(19N-32W-2ddaa)
McPherson County

Location: NE NE SE SE sec. 2, T. 19 N., R. 32 W., 1,270 ft. north and 37 ft. west of southeast corner.
Ground elevation: 3,310 ft. (t). (Tryon NW 7.5 min. quadrangle).
Depth to water: Not measured.
Total depth: 840 ft.

	Depth, in feet	
	From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, slightly silty, pale olive.	0.0	30.0
Silt, slightly to moderately sandy, very fine to fine, pale olive	30.0	38.0
Sand, very fine to fine, very silty, pale olive	38.0	46.0
Silt, slightly sandy, very fine, pale olive	46.0	85.0
Sand, very fine, slightly to moderately silty, pale olive	85.0	97.0
Sand, very fine to fine, moderately to very silty, pale olive	97.0	134.0
Sand, very fine to medium, slightly silty, brown to pale olive	134.0	145.0
Sand, very fine to medium, moderately to very silty, brown	145.0	150.0
Sand, very fine to fine, slightly to moderately silty, brown	150.0	187.0
Silt, very sandy, very fine to fine, brown	187.0	190.0
Sand, very fine to fine, slightly to moderately silty, brown	190.0	235.0
Silt, interbedded sands, very fine to fine, shell fragments, green and olive	235.0	266.0
Sand, very fine to fine, trace shell fragments, brown	266.0	270.0
Silt, slightly sandy, very fine to fine, green and olive	270.0	279.0
Sand, very fine to fine, slightly to moderately silty, brown	279.0	282.0
Silt, olive and green	282.0	283.0
Sand, very fine to fine, slightly silty, siltier 297 to 301 feet, brown to gray	283.0	309.0
Silt, slightly limy, brown and olive	309.0	318.0
Sand, very fine to fine, slightly to moderately silty, shell fragments, brown	318.0	322.0
Silt, brown and olive	322.0	328.0
Sand, very fine to fine, brown	328.0	338.0
Silt, brown	338.0	340.0

Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, fine sand to coarse gravel, trace rootlets and sandstone fragments	340.0	358.0
Silt, very sandy, very fine to coarse, trace brown sandstone, brown	358.0	366.0
Sand and gravel, very fine sand to fine gravel, much coarse to very coarse	366.0	384.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Sandstone, very fine to fine, slightly to moderately silty, marly, olive	384.0	390.0
Sand to sandstone, very fine to fine, rootlets, silty at 421 ft., olive gray	390.0	449.0
Sandstone, very fine to fine, slightly to moderately silty, brown	449.0	455.0
Sand to sandstone, very fine to fine,, rare limy gray silt, brown	455.0	491.0
Sandstone, very fine to fine, slightly to moderately silty, brown	491.0	494.0
Sandstone, very fine to fine, lime cemented, brown to pale brown	494.0	518.0
Sandstone, very fine to fine, lime cemented, brown to pale brown	518.0	526.0
Sand, very fine to fine, brown	526.0	535.0
Sandstone, very fine to fine, moderately silty and limy, pale brown	535.0	537.0
Sand to sandstone, very fine to fine, lime cemented, pale brown	537.0	551.0
Sandstone, very fine to fine, moderately silty, rootlets, in part limy, brown	551.0	562.0
Sand, very fine to fine, rootlets, brown	562.0	570.0
Sand to sandstone, very fine to fine, rootlets, trace silt seams, brown	570.0	604.0
Sand, very fine to fine, pepper appearance, gray brown	604.0	633.0
Silt, very sandy, very fine to fine, yellow	633.0	636.0
Sand, very fine to fine, brown to olive	636.0	641.0
Silt, very sandy, very fine to fine, light gray	641.0	644.0
Sand, very fine to fine, trace medium to coarse, gray brown to olive	644.0	647.0
Silt, slightly sandy, very fine to fine, pale olive.	647.0	650.0
Sand, very fine to coarse, much fine to medium, rootlets, pale olive	650.0	690.0
Silt, olive	690.0	691.0
Sand, very fine to medium, pale olive	691.0	695.0
Silt, olive	695.0	696.0
Sandy, very fine to medium, olive	696.0	700.0
Silt, slightly to moderately sandy, olive	700.0	703.0
Sand, very fine to medium, trace coarse, pale olive.	703.0	732.0

Sandstone to sand, very fine to fine, olive brown...	732.0	780.0
Sandstone, very fine to fine, moderately silty and limy, pale brown.....	780.0	800.0
Siltstone, moderately sandy, very fine to fine, limy, pale brown.....	800.0	820.0
Tertiary System - Oligocene Series - White River Group:		
Brule Formation:		
Siltstone, brown to dark brown.....	820.0	840.0

Test Hole #57-C-81 (E-logs)
(19N-35W-5daaa)
McPherson County

Location: NE NE NE SE sec. 5, T. 19 N., R. 35 W., 2,607 ft. north and 86 ft. west of southeast corner.
Ground elevation: 3,473.65 ft. (i). (Whitewater Lake 7.5 min. quadrangle).
Depth to water: 10.65 ft. (6-9-81).
Total depth: 618 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, very slightly silty, dark gray	0.0	6.0
Silt, very sandy, very fine sand, gray brown	6.0	7.0
Sand, very fine to fine, trace medium, light brown	7.0	28.0
Sand, very fine to medium, rare coarse, trace iron cemented areas, light gray	28.0	46.0
Sand, very fine to medium, slightly silty, gray	46.0	68.0
Sand, very fine to medium, trace coarse, trace silt seams, gray	68.0	114.0
Sand, very fine to fine, moderately silty, silt is brown, sand is gray	114.0	120.0
Sand, very fine to medium, gray	120.0	143.0
Silt, very sandy, very fine to fine sand, brown	143.0	145.0
Sand, very fine to fine, trace medium, increasingly silty, gray	145.0	178.0
Silt, very sandy, very fine sand, greenish gray	178.0	184.0
Sand, very fine to medium, much medium, gray	184.0	188.0
Silt, very sandy, very fine to medium, greenish gray	188.0	198.0
Sand, very fine to medium, slightly to moderately silty, interbedded thin silt seams, gray	198.0	220.0
Sand, very fine to coarse, much medium, gray	220.0	230.0
Sand, very fine to fine, trace medium, slightly to moderately silty, light brown and brownish gray	230.0	250.0
Sand, very fine to coarse, much medium, light brownish gray	250.0	256.0
Sand, very fine to fine, trace medium, moderately silty, silt is blue-gray, sand is light brownish gray	256.0	268.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, fine sand to fine gravel, much very coarse sand to fine gravel, gray green	268.0	294.0

Tertiary System - Miocene Series - Ogallala Group, undifferentiated:

Sandstone, very fine to fine sand, very silty, moderately to very clayey, dark gray.....	294.0	301.0
Sandstone, very fine to fine sand, trace medium, many rootlets, slightly silty, trace hackberry seed fragments, rare bone fragments, yellow brown to pale olive.....	301.0	322.0
Sandstone, very fine to very coarse sand, trace fine gravel, many rootlets, trace hackberry seed fragments, light brown to yellow brown.....	322.0	343.0
Sandstone, very fine to fine, trace of medium, slightly to moderately silty, many rootlets, pale brown.....	343.0	361.0
Sand to sandstone, very fine to medium, trace of coarse, rootlets, interbedded thin silt seams, light brown to pale olive brown.....	361.0	410.0
Sand, very fine to coarse, much medium, pale olive yellow.....	410.0	420.0
Sand to sandstone, very fine to medium sand, trace of coarse, rootlets, many seed fragments, pale olive yellow.....	420.0	446.0
Sandstone, very fine to medium, rootlets, light yellow brown.....	446.0	460.0
Sand, very fine to coarse, much medium, light brown.	460.0	478.0
Sandstone, very fine to medium, trace coarse, moderately to very silty, in part lime cemented, seed fragments, pale yellow to white.....	478.0	498.0
Sand to sandstone, very fine to medium, rare coarse to very coarse, slightly silty, trace of rootlets, light brownish gray to olive.....	498.0	576.0
Sand and sandstone, coarser, slightly silty, very fine to medium, some coarse to very coarse, trace of rootlets, pale olive to olive.....	576.0	618.0

Test Hole #42-C-81 (E-log)
(19N-35W-6adc)
McPherson County

Location: SW SE NE sec. 6, T. 19 N., R. 35 W. Distances and elevation surveyed by Twin Platte NRD crew.
Ground elevation: 3,482.53 ft (i). (Lena 7.5 min. quadrangle).
Depth to water: 4.02 ft. (6-1-81).
Total depth: 25 ft.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, trace medium, light brown..	0.0	4.0
Sand, very fine to fine, light grayish brown.....	4.0	22.0
Sand, very fine to fine, trace of medium, light grayish brown.....	22.0	25.0

Test Hole #22-B-83 (E-log)
(19N-35W-7baaa)
McPherson County

Location: NE NE NE NW sec. 7, T. 19 N., R. 35 W. Distances and elevations determined by Twin Platte NRD survey crew.
Ground elevation: 3,602 ft. (i). (Lena 7.5 min. quadrangle).
Depth to water: 127 ft. (8-19-83).
Total depth: 170 ft.

	Depth, in feet	
	From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to medium, organics from 0 to 0.5 ft., brownish gray.....	0.0	5.0
Sand, very fine to medium, pale olive.....	5.0	10.0
Sand, very fine to medium, slightly silty, light brownish gray to light yellowish brown.....	10.0	25.0
Sand, very fine to fine, rare medium, pale brown....	25.0	100.0
Sand, very fine to medium, trace coarse, pale brown.	100.0	126.0
Sand, very fine to fine, interbedded silt seams, brown to pale brown.....	126.0	144.0
Silt, very sandy, very fine sand, light olive gray to gray.....	144.0	160.0
Sand, very fine to coarse, slightly silty, light brownish gray to light olive gray.....	160.0	170.0

Test Hole #40-C-81 (E-logs)
(19N-35W-7cabd)
McPherson County

Location: SE NW NE SW sec. 7, T. 19 N., R. 35 W. Distances and elevation measured by Twin Platte NRD crew.
Ground elevation: 3,483 (i). (Lena 7.5 min. quadrangle).
Depth to water: 7.87 ft. (8-4-81).
Total depth: 305 ft.

	Depth, in feet	
	From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, trace of medium, trace organic material, trace shell fragments, dark brown and brown.....	0.0	10.0
Silt, very sandy, very fine sand, trace shell fragments, greenish gray.....	10.0	17.0
Sand, very fine to fine, trace medium, trace shell fragments, brownish gray.....	17.0	45.0
Sand, very fine to coarse, much medium, brownish gray.....	45.0	53.0
Silt, slightly clayey, moderately sandy, very fine sand, dark greenish gray.....	53.0	61.0
Sand, very fine to coarse, much medium, brownish gray.....	61.0	69.0
Silt, very sandy, very fine to medium sand, grayish brown to dark grayish brown.....	69.0	80.0
Sand, very fine to medium, trace of coarse, grayish brown.....	80.0	84.0
Silt, very sandy, very fine to medium sand, greenish gray.....	84.0	88.0
Sand, very fine to fine, trace medium, silty 98 to 108 ft., olive gray.....	88.0	116.0
Silt, very sandy, sand is very fine to fine, greenish gray.....	116.0	125.0
Sand, very fine to medium, trace coarse, silty 155 to 158 ft., light brown to grayish brown.....	125.0	168.0
Silt, very sandy, very fine sand, greenish gray.....	168.0	178.0
Sand, very fine to medium, trace coarse, brownish gray.....	178.0	187.0
Silt, very sandy, very fine to fine, trace medium, brownish gray.....	187.0	193.0
Sand, very fine to medium, trace coarse, brownish gray.....	193.0	201.0
Silt, very sandy, very fine to fine sand, greenish gray.....	201.0	206.0

Sand, very fine to coarse, much medium, brownish gray	206.0	221.0
Silt, very sandy, very fine to medium sand, brownish gray	221.0	229.0
Sand, very fine to coarse, trace very coarse, much medium, brownish gray	229.0	261.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand to sand and gravel, very fine sand to fine gravel, much coarse to very coarse sand, few thin interbedded green claystones, trace rootlets, yellowish red	261.0	293.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Sandstone, very fine to fine sand, very silty, slightly to moderately clayey, rootlets, pale olive	293.0	305.0

Test Hole #41-C-81 (E-log)
(19N-35W-7cbac)
McPherson County

Location: SW NE NW SW sec. 7, T. 19 N., R. 35 W. Elevation and distances determined by Twin Platte NRD survey team.
Ground elevation: 3,479 ft. (i). (Lena 7.5 min. quadrangle).
Depth to water: 1.04 ft. (6-1-81).
Total depth: 18 ft.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, slightly silty, trace of snail shells, brown.....	0.0	3.0
Silt, very sandy, very fine sand, gray with bluish gray and brown interbeds.....	3.0	6.0
Sand, very fine to fine, trace of medium, grayish brown.....	6.0	18.0

Test Hole #39-C-81 (E-log)
(19N-35W-8cdab)
McPherson County

Location: NW NE SE SW sec. 8, T. 19 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey team.
Ground elevation: 3,471.88 ft (t). (Lena 7.5 min. quadrangle).
Depth to water: 2.6 ft. (5-29-81).
Total depth: 18 ft.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, trace medium, trace snail shells, trace fine silt seams, dark grayish brown.	0.0	3.0
Sand, very fine to fine, trace medium, trace shell fragments, trace silt seams, light gray.....	3.0	18.0

Test Hole #37-C-81 (E-log)
(19N-35W-16adad)
McPherson County

Location: SE NE SE NE sec. 16, T. 19 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey crew.
Ground elevation: 3,449.1 ft. (i). (Flats 7.5 min. quadrangle).
Depth to water: 5.65 ft. (8-20-81).
Total depth: 98 ft.

	Depth, in feet	
	From	To
Quaternary System and Teritary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, trace medium, very slightly silty, grayish brown.....	0.0	3.0
Sand, very fine to fine, trace medium, trace shell fragments, pale olive.....	3.0	8.0
Sand, very fine to fine, with thin light brown and light gray silt seams, trace shell fragments, light olive brown.....	8.0	18.0
Sand, very fine to fine, trace medium, trace thin silt seams, gray.....	18.0	45.0
Sand, very fine to fine, trace medium, slightly to to moderately silty, olive gray to gray.....	45.0	60.0
Sand, very fine to fine, trace of medium, trace of silt, trace of shell fragments, gray.....	60.0	79.0
Sand to sandstone, very fine, trace fine, trace rootlets, gray green.....	79.0	84.0
Sand, very fine to fine, trace medium, trace root-lets, gray.....	84.0	98.0

Test Hole #40B-HP-79 (E-logs)
(19N-35W-25cbcc)
McPherson County

Location: SW SW NW SW sec. 25, T. 19 N., R. 35 W., approximately 1,600 ft. north and 45 ft. east of southwest corner.
Ground elevation: 3,410 ft. (t). (Flats 7.5 min. quadrangle).
Depth to water: Not measured.
Total depth: 825 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to medium, slightly silty, dark brown	0.0	10.0
Silt, very sandy, very fine to fine, pale olive	10.0	15.0
Sand, very fine to coarse, slightly to moderately silty, pale olive	15.0	40.0
Interbedded silt and sand, very fine to medium with trace coarse to very coarse, pale olive to pale brown	40.0	68.0
Sand, very fine to medium, with interbedded silt and clay seams, gray to pale olive	68.0	148.0
Silt, clayey, very sandy, green to gray	148.0	150.0
Sand, very fine to very coarse, much fine to medium, slightly to moderately silty with green to gray siltstone seams	150.0	242.0
Silt, clayey, moderately sandy, gray to green	242.0	245.0
Sand, very fine to very coarse, moderately silty	245.0	250.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, medium sand to fine gravel, trace clay seams	250.0	263.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Silt to siltstone, clayey with sand seams, to green gray	263.0	302.0
Sandstone, very fine to medium, occasional clayey silt seams, rootlets, brown	302.0	365.0
Sand, very fine to fine, rootlets, brown	365.0	392.0
Silt, clayey, limy, white	392.0	405.0
Sand to sandstone, very fine to medium, slightly silty, rootlets, brown	405.0	420.0
Sandstone to sand, very fine to medium, in part lime cemented, brown to white	420.0	490.0
Sand and sandstone, very fine to coarse, much fine to medium, silt seams, in part limy, gray to green to white	490.0	525.0

Sand, very fine to medium, trace coarse to very coarse, with sandstone, silt and clay seams, brown to green gray to white.....	525.0	565.0
Sand to sandstone, very fine to coarse, trace very coarse, with limy clay seams, pale brown.....	565.0	583.0
Siltstone with sand and limy sandstone seams, pale yellow to olive to yellow.....	583.0	616.0
Sand, very fine to medium, trace coarse to very coarse, in part limy, brown to pale yellow.....	616.0	650.0
Siltstone, moderately sandy, very fine to medium, trace coarse to very coarse, limy, pale yellow to white.....	650.0	682.0
Sand, very fine to medium, with pale yellow siltstone seams.....	682.0	702.0
Siltstone, clayey, moderately sandy, very fine to medium, pale yellow to olive.....	702.0	725.0
Sand, very fine to very coarse, with pale yellow and pink siltstone seams.....	725.0	776.0
Siltstone, pale brown.....	776.0	782.0
Sand, very fine to very coarse, with some light brown silt and siltstone.....	782.0	804.0
Tertiary System - Eocene Series - White River Group:		
Brule Formation:		
Siltstone, light brown.....	804.0	825.0

Test Hole #38-HP-79 (E-logs)
(20N-30W-9adda)
McPherson County

Location: NE SE SE NE sec. 9, T. 20 N., R. 30 W., 2,140 ft. south and 81 ft. west of northeast corner.
Ground elevation: 3,140 ft. (t). (Tryon NE 7.5 min. quadrangle).
Depth to water: Not measured.
Total depth: 740 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to coarse, interbedded slit and clay seams, trace iron stain, brownish gray to pale olive	0.0	52.0
Silt, moderately to very clayey, moderately sandy, very fine to fine, pale olive	52.0	63.0
Sand, very fine to medium, with interbedded clay and silt seams, brown to pale olive	63.0	92.0
Silt, moderately to very clayey, slightly sandy, slightly to very limy, pale olive to white	92.0	138.0
Sand, very fine to fine, moderately silty, pale olive	138.0	150.0
Silt, moderately to very clayey, interbedded sand seams, very fine to medium sand, pale olive	150.0	206.0
Sand, very fine to medium, slightly silty, light olive gray	206.0	229.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, fine sand to fine gravel	229.0	245.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Sand to sandstone, very fine to medium, slightly silty, rootlets, pale olive	245.0	274.0
Sand, very fine to medium, trace coarse, rootlets, pale olive to gray	274.0	346.0
Silt, very clayey, pale yellow	346.0	360.0
Sand to sandstone, very fine to fine, moderately silty, trace rootlets, pale olive	360.0	386.0
Sandstone, very fine to medium, moderately to very silty, very limy, in part very clayey, light gray.	386.0	414.0
Silt, moderately sandy, very fine to medium, pale gray to pale olive	414.0	434.0
Sand to sandstone, very fine to medium, moderately silty, limy, pale olive	434.0	442.0
Sandstone, very fine to medium, moderately to very silty, pale olive	442.0	482.0
Sand to sandstone, very fine to fine, pale olive	482.0	497.0

Sandstone to sand, very fine to medium, slightly to moderately silty, slightly to moderately clayey, olive to pale olive.....	497.0	546.0
Sand, very fine to coarse, rootlets, in part very limy, pale olive to pale yellow.....	546.0	578.0
Sandstone to sand, very fine to medium, trace coarse sand to fine gravel, limy 595 to 614 ft., moderately silty, pale olive to pale brown.....	578.0	614.0
Claystone, slightly sandy, very fine to medium, limy, pale yellow to pale olive to green.....	614.0	658.0
Tertiary System - Eocene Series - White River Group:		
Brule Formation:		
Silt to siltstone, moderately sandy, very fine, moderately clayey, olive to pale olive.....	658.0	699.0
Siltstone, brown with olive to trace reddish brown..	699.0	740.0

Test Hole #34-B-71 (E-logs)
(20N-32W-2baab)
McPherson County

Location: NW NE NE NW sec. 2, T. 20 N., R. 32 W., 83 ft. south and 2,200 ft. east of northwest corner.
Ground elevation: 3,330 ft. (t). (Tryon NW 7.5 min. quadrangle)
Depth to water: 47 ft. (9-1-71).
Total depth: 800 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to medium, slightly to moderately silty, dark brown to olive.....	0.0	12.0
Sand, very fine to medium, very silty, olive.....	12.0	15.0
Sand, very fine to medium, slightly silty, pale olive.....	15.0	40.0
Sand, very fine to medium, very silty, olive gray...	40.0	44.0
Sand, very fine to medium, slightly silty, pale olive.....	44.0	50.0
Sand, very fine to medium, slightly to moderately silty, pale olive.....	50.0	73.0
Silt, very sandy, very fine to medium, pale yellow..	73.0	82.0
Sand, very fine to medium, slightly silty, pale yellow.....	82.0	101.0
Silt, very sandy, very fine to medium, pale olive...	101.0	104.0
Sand, very fine to medium, slightly silty, pale olive.....	104.0	114.0
Silt, very sandy, very fine to medium, trace rootlets, olive gray.....	114.0	116.0
Sand, very fine to medium, slightly to moderately silty, pale olive.....	116.0	212.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Sandstone, very fine to medium, moderately to very silty, slightly clayey, pale olive to brown.....	212.0	242.0
Sand, very fine to medium, slightly silty, pale olive.....	242.0	252.0
Sandstone, very fine to medium, moderately silty, slightly clayey, pale olive.....	252.0	256.0
Sand to sandstone, very fine to medium, slightly to moderately silty, slightly clayey, pale olive to light gray.....	256.0	275.0
Sand, very fine to medium, very silty, slightly to moderately clayey, light brown to reddish yellow..	275.0	303.0

Sandstone, very fine to medium, trace coarse, moderately clayey, yellow red to brown.....	303.0	333.0
Sand to sandstone, very fine to medium, trace coarse to very coarse, slightly silty, rootlets, light gray brown to olive.....	333.0	352.0
Sand and gravel, very fine sand to coarse gravel, trace very coarse gravel, 25 to 30% gravel.....	352.0	364.0
Sand, very fine to very coarse, trace fine gravel, very silty, pale olive.....	364.0	393.0
Siltstone, moderately sandy with sandstone seams, very fine to medium, trace rootlets, light olive gray.....	393.0	416.0
Sand to sand and gravel, very fine sand to fine gravel, moderately silty, rootlets, olive.....	416.0	434.0
Silt, very sandy, very fine to very coarse, olive...	434.0	438.0
Sand, very fine to medium, trace coarse to very coarse and fine gravel, slightly silty, olive.....	438.0	464.0
Silt, very sandy, very fine to medium, olive.....	464.0	467.0
Sand to sandstone, very fine to medium, moderately limy, gray to olive.....	467.0	482.0
Sandstone, very fine to medium, slightly to moderately silty, moderately limy, olive to light gray.....	482.0	489.0
Sandstone to sand, very fine to medium, slightly silty, white siltstone seam at 537 ft., slightly to moderately limy, olive to light gray to white..	489.0	534.0
Sandstone, very fine to medium, moderately to very silty, marly, limy, white.....	534.0	544.0
Sandstone, very fine to fine, slightly silty, lime cemented, white.....	544.0	550.0
Silt to siltstone, moderately to very sandy, very fine to fine, slightly to moderately clayey, slightly to moderately limy, trace manganese stain, light yellow brown to reddish brown to pale olive to white.....	550.0	620.0
Sand to sandstone, very fine to medium, slightly to moderately silty, pale yellow to pale olive.....	620.0	630.0
Siltstone, very sandy, very fine to medium, light olive gray and reddish yellow.....	630.0	634.0
Sand to sandstone, very fine to medium, slightly to moderately silty, light olive gray with reddish yellow silts.....	634.0	654.0
Siltstone, slightly to very sandy, moderately limy, slightly to moderately clayey, olive gray to brown	654.0	667.0
Sand to sandstone, very fine to medium, very silty, light olive gray with reddish yellow.....	667.0	673.0

Siltstone, slightly to moderately sandy, very fine to medium, light olive gray with reddish yellow...	673.0	676.0
Sand to sandstone, very fine to coarse, slightly to moderately silty with siltstons seams, in part slightly limy, brown and olive to pale olive.....	676.0	760.0
Silt, very sandy, very fine to fine, trace medium, slightly to moderately clayey, in part slightly limy, pale olive yellow to very pale olive.....	760.0	775.0
Sand, very fine to fine, very silty, moderately to very limy, rootlets, pale olive to olive brown....	775.0	784.0
Silt, moderately sandy, very fine to fine, moderately limy, pale yellow.....	784.0	790.0
Sand to sandstone, very fine to fine, trace rootlets, slightly to moderately silty, pale olive green....	790.0	800.0

Test Hole #30-SH-87 (E-log)
(20N-32W-11daaa)
McPherson County

Location: NE NE NE SE sec. 11, T. 20 N., R. 32 W., 2,570 ft. north and 265 ft. west of southeast corner.
Ground elevation: 3,358 ft. (t). (Tryon NW 7.5 min. quadrangle).
Depth to water: Not measured.
Total depth: 940 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to medium, moderately silty, dark brown to brown	0.0	15.0
Sand, very fine to medium, slightly silty, light gray	15.0	32.0
Silt, slightly clayey, slightly sandy, very fine sand, trace iron stain, light gray	32.0	45.0
Sand, very fine to medium, trace iron stain, silty 62 to 66 ft., light gray to gray	45.0	70.0
Silt, slightly clayey, trace sand, very fine to fine, light gray	70.0	75.0
Sand, very fine to fine, trace medium, rare coarse, interbedded thin silty areas, light gray	75.0	157.0
Silt, very sandy, very fine to fine sand, yellow brown	157.0	169.0
Sand, very fine to fine, trace medium to coarse, interbedded silty areas, pale yellow to brown	169.0	260.0
Silt, moderately sandy, very fine to medium sand, slightly clayey, light gray to yellowish brown	260.0	307.0
Clay, silty, slightly sandy, very fine to medium sand, light gray to brownish yellow	307.0	331.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand, very fine to coarse, much medium, light brownish gray	331.0	348.0
Sand and gravel, fine sand to fine gravel, much coarse to very coarse sand	348.0	364.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Sandstone, very fine to medium sand, slightly to moderately silty, trace rootlets, light yellowish brown to brown	364.0	398.0
Sand, very fine to medium, trace rootlets, brown	398.0	408.0
Sand to sandstone, very fine to medium, trace rootlets, light yellowish brown	408.0	413.0

Sand, very fine to medium, trace rootlets, light gray to brown	413.0	470.0
Silt, trace claystone, trace of sand, in part limy and cemented, brown to white	470.0	500.0
Sand to sandstone, very fine to medium, sandstone in part cemented and calcareous, brown	500.0	530.0
Silt, moderately clayey, in part calcareous and limy, interbedded sand to sandstone seams, pale brown to pale yellow to white	530.0	580.0
Sand to sandstone, very fine to medium sand, slightly to moderately silty, trace rootlets, pale olive	580.0	618.0
Sand, very fine to medium, trace sandstone seams, olive to pale olive	618.0	660.0
Sand with interbedded sandstone, sand is very fine to medium with coarse to very coarse, sandstone is slightly silty and slightly calcareous, pale yellow to pale olive	660.0	696.0
Sand, very fine to very coarse, much medium, trace rootlets, light brownish gray	696.0	722.0
Sand to sandstone, very fine to medium, in part silty, in part slightly limy, light brownish gray with cemented white areas	722.0	790.0
Sand to sandstone, very fine to fine, trace medium, in part silty and limy, light brownish gray to white	790.0	840.0
Sand to sandstone, very fine to fine, trace medium, light gray to white	840.0	860.0
Sand to sandstone, very fine to fine, trace medium, moderately silty, in part limy, gray to white	860.0	886.0
Sand to sandstone, very fine to fine, trace medium, slightly silty, very pale brown to pale brown	886.0	908.0
Tertiary System - Eocene Series - White River Group:		
Brule Formation:		
Siltstone, very hard pink fragments, brown to reddish brown	908.0	940.0

Test Hole #20-S-82 (E-logs)
(20N-34W-32ddcc)
McPherson County

Location: SW SW SE SE sec. 32, T. 20 N., R. 34 W., 148 ft. north and approximately 1,200 ft. west of southeast corner.
Ground elevation: 3,420 ft. (Whitewater Lake 7.5 min. quadrangle).
Depth to water: Not measured.
Total depth: 780 ft.

	Depth, in feet From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to medium, brown	0.0	5.0
Silt, very sandy, very fine to medium, slightly clayey, olive gray	5.0	16.0
Sand, very fine to medium, much medium, gray brown	16.0	34.0
Sand, very fine to medium, slightly silty, gray brown	34.0	40.0
Sand, very fine to medium, trace coarse to very coarse, gray brown to brown	40.0	57.0
Silt, moderately sandy, slightly to moderately clayey, dark gray green	57.0	62.0
Sand, very fine to medium, trace coarse, gray brown	62.0	68.0
Silt, moderately sandy and clayey, light green	68.0	72.0
Sand, very fine to medium, gray brown	72.0	78.0
Silt, very clayey, moderately sandy, gray green	78.0	85.0
Sand, very fine to medium, gray brown	85.0	90.0
Silt, moderately clayey and sandy, gray green	90.0	93.0
Sand, very fine to medium, gray brown	93.0	98.0
Silt, moderately clayey and sandy, gray green	98.0	99.0
Sand, very fine to medium, gray brown	99.0	120.0
Interbedded sand, very fine to medium, brown, and silt, moderately clayey, gray green	120.0	158.0
Sand, very fine to fine, trace medium, brown	158.0	171.0
Sand, very fine to medium, slightly to moderately silty, brown	171.0	196.0
Sand, very fine to medium, gray brown	196.0	200.0
Silt, slightly clayey, moderately sandy, gray brown	200.0	203.0
Sand, very fine to medium, trace coarse, slightly silty, gray brown	203.0	208.0
Silt, moderately clayey, reddish brown	208.0	218.0
Sandy, very fine to coarse, much medium, gray green	218.0	221.0
Silt, moderately clayey, gray green	221.0	227.0

Sand, very fine to coarse, much medium, occasional silt seam, gray brown	227.0	258.0
Silt, slightly to moderately clayey, gray brown	258.0	261.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, fine sand to fine gravel, much coarse, trace medium to coarse gravel, trace rootlets, silt seam at 285 feet	261.0	302.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Silt, moderately clayey, gray	302.0	309.0
Sand, very fine to medium, olive	309.0	320.0
Sandstone, very fine to fine, moderately silty, pale brown to brown	320.0	329.0
Sand, very fine to very coarse, trace fine gravel, rootlets, brown	329.0	353.0
Silt, slightly sandy, pale yellow	353.0	358.0
Sand to sandstone, very fine to very coarse, much fine, moderately silty, rootlets, pale yellow to brown	358.0	367.0
Sand, very fine to medium, trace coarse to very coarse and fine gravel, peppery	367.0	386.0
Silt, gray	386.0	388.0
Sand, very fine to medium, trace coarse, pepper	388.0	407.0
Sandstone, very fine to fine, moderately silty, rootlets, pale yellow to brown	407.0	411.0
Sand, very fine to coarse	411.0	418.0
Silt, moderately sandy, gray	418.0	422.0
Sand, very fine to coarse, rare very coarse sand to fine gravel, trace yellow siltstone seams, brown	422.0	465.0
Sandstone, very fine to fine, lime cemented, pale brown	465.0	480.0
Sand, very fine to medium, brown	480.0	487.0
Sandstone, very fine to medium, moderately silty, brown to olive	487.0	495.0
Sandstone, very fine to fine, slightly silty, rootlets, pale brown	495.0	502.0
Sand, very fine to fine, brown	502.0	511.0
Sandstone, very fine to fine, moderately to very silty, pale yellow to pale brown	511.0	518.0
Sand to sandstone, very fine to medium, rootlets, moderately silty, pale olive to pale yellow and gray	518.0	543.0
Sand, very fine to medium, pale olive	543.0	549.0
Interbedded sand and sandstone, very fine to medium, trace rootlets, moderately silty, pale yellow to pale olive, brown	549.0	577.0

Sand, very fine to very coarse, much medium to coarse, trace rootlets, rare thin slit seam, olive to brown.....	577.0	629.0
Silt to siltstone, olive to pale olive.....	629.0	631.0
Sand, very fine to medium, much fine, thin gray silt seams.....	631.0	647.0
Sandstone to sand, very fine to medium, slightly silty, lime cemented, pale brown.....	647.0	664.0
Sand, very fine to medium, trace coarse, thin interbedded pale yellow and gray silt seams.....	664.0	683.0
Sandstone, very fine to medium, moderately silty, silt is white to pale olive, pale olive.....	683.0	709.0
Sand, very fine to medium, much fine, pale olive....	709.0	715.0
Sand to sandstone, very fine to medium, trace coarse to very coarse, slightly to moderately silty, silt is gray, olive to pale olive.....	715.0	730.0
Sandstone, very fine to medium, slightly to moderately silty, lime cemented, very pale brown..	730.0	737.0
Siltstone, limy, pale brown.....	737.0	761.0
Sand, very fine to coarse, moderately silty.....	761.0	770.0
Tertiary System - Eocene Series - White River Group:		
Brule Formation:		
Siltstone, limy, pale brown.....	770.0	780.0

Test Hole #34-C-81 (E-logs)
(20N-35W-19cdcc)
McPherson County

Location: SW SW SE SW sec. 19, T. 20 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey crew.
Ground elevation: 3,499.24 ft. (i). (Lena 7.5 min. quadrangle).
Depth to water: 9.89 ft. (9-24-81).
Total depth: 303 ft.

	Depth, in feet	
	From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, trace medium, slightly silty with organics	0.0	3.0
Sand, very fine to fine, trace medium, trace shell fragments, trace thin limy layers, light brown	3.0	17.0
Sand, very fine to fine, trace medium, very silty, interbedded green clay seams, light gray to gray	17.0	42.0
Sand, very fine to fine, trace medium, rare coarse, gray	42.0	76.0
Silt, very sandy, very fine sand, light gray to gray	76.0	87.0
Sand, very fine to medium, silty 98 to 102 and 154 to 157 ft., gray	87.0	173.0
Silt, very sandy, very fine to fine sand, trace medium, trace shell fragments, greenish gray	173.0	188.0
Sand, very fine to medium, trace coarse, gray	188.0	201.0
Peat, very sandy, diatomaceous, fibrous, chunks, dark brownish red	201.0	203.0
Silt, very sandy, very fine to fine, trace medium, light gray	203.0	208.0
Sand, very fine to medium, trace coarse, much medium, silt seams at 212 ft. and 218 ft., gray	208.0	242.0
Sand, very fine to very coarse, trace fine gravel, much coarse, light gray brown	242.0	260.0
Sand, very fine to coarse, trace very coarse, moderately silty, yellow brown	260.0	280.0
Tertiary System - Pliocene Series - Broadwater Formation:		
Sand and gravel, very fine sand to fine gravel, much coarse sand to fine gravel, trace medium gravel, trace rootlets, yellow brown	280.0	298.0
Tertiary System - Miocene Series - Ogallala Group, undifferentiated:		
Sandstone, very fine to fine, trace medium, slightly silty, trace rootlets, light brownish gray	298.0	303.0

Test Hole #36-C-81 (E-log)
(20N-35W-19cdcc)
McPherson County

Location: SW SW SE SW sec. 19, T. 20 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey crew.
Ground elevation: 3,492.98 ft. (i). (Lena 7.5 min. quadrangle).
Depth to water: 3.09 ft. (8-20-81).
Total depth: 18 ft.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Silt, moderately sandy, very fine to fine sand, very organic rich, very dark brown.....	0.0	0.5
Sand, very fine to fine, slightly to moderately silty, brown with light gray silt seams.....	0.5	6.0
Sand, very fine to fine, trace medium, very slightly silty, gray.....	6.0	18.0

Test Hole #45-C-81 (E-log)
(20N-35W-20dbba)
McPherson County

Location: NE NW NW SE sec. 20, T. 20 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey crew.
Ground elevation: 3,498.85 ft. (i). (Whitewater Lake 7.5 min. quadrangle).
Depth to water: 25.11 ft. (6-2-81).
Total depth: 108 ft.

	Depth, in feet	
	From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, trace medium, dark brown to brown.....	0.0	4.0
Sand, very fine to fine, trace medium, slightly silty light brown to brown.....	4.0	39.0
Silt, moderately sandy, very fine sand, trace fine to medium, light brown.....	39.0	45.0
Sand, very fine to fine, trace medium, light brown..	45.0	87.0
Silt, very sandy, very fine to fine sand, light brown to gray.....	87.0	94.0
Sand, very fine to medium, trace coarse, gray.....	94.0	108.0

Test Hole #44-C-81 (E-log)
(20N-35W-28bbcc)
McPherson County

Location: SW SW NW NW sec. 28, T. 20 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey crew.
Ground elevation: 3,471.44 ft. (i). (Whitewater Lake 7.5 min. quadrangle).
Depth to water: 1.6 ft. (March 1982)
Total depth: 17 ft.

	Depth, to water	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, trace medium, moderately silty, many snail shells, brown to light gray brown.....	0.0	6.0
Sand, very fine to fine, trace medium, slightly silty, thin greenish silt seams, trace shell fragments, light grayish brown.....	6.0	17.0

Test Hole #43-C-81 (E-log)
(20N-35W-28dbba)
McPherson County

Location: NE NW NW SE sec. 28, T. 20 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey crew.
Ground elevation: 3,461.77 ft. (t). (Whitewater Lake 7.5 min. quadrangle).
Depth to water: +0.4 ft. (March 1982)
Total depth: 18 ft.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, trace medium, light gray brown.....	0.0	3.0
Sand, very fine to fine, trace medium, rare coarse, interbedded thin silt seams, gray.....	3.0	18.0

Test Hole #30-C-81 (E-log)
(20N-35W-31caba)
McPherson County

Location: NE NW NE SW sec. 31, T. 20 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey crew.
Ground elevation: 3,497.74 ft. (i). (Lena 7.5 min. quadrangle).
Depth to water: 12.06 ft. (5-22-81).
Total depth: 58 ft.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, trace of top soil, dark brown to brown.....	0.0	5.0
Silt, slightly clayey, moderately sandy, very fine sand, brown.....	5.0	11.0
Sand, very fine to fine, trace medium, slightly silty, brown.....	11.0	22.0
Silt, slightly clayey, very sandy, very fine sand, pale brown.....	22.0	38.0
Sand, very fine to fine, trace medium to coarse, slightly silty, trace red ironstone particles, pale brown.....	38.0	58.0

Test Hole #47-C-81 (E-log)
(20N-35W-32adcc)
McPherson County

Location: SW SW SE NE sec. 32, T. 20 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey crew.
Ground elevation: 3,468.20 ft. (i). (Whitewater Lake 7.5 min. quadrangle).
Depth to water: 1.06 ft. (8-18-81).
Total depth: 98 ft.

	Depth, in feet	
	From	To
Quaternary System and Tertiary System - Pliocene Series, undifferentiated:		
Sand, very fine to fine, moderately silty, dark gray brown.....	0.0	3.0
Sand, very fine to medium, trace coarse, slightly silty, dark brown silt, sand is light brown to yellow brown.....	3.0	14.0
Peat, spongy organic material, silty, clayey, some very fine to fine sand, dark reddish brown and black.....	14.0	25.5
Sand, very fine to medium, much medium, trace coarse, occasional light brown silt seam, light brown.....	25.5	33.0
Sand, very fine to medium, trace coarse, slightly silty, gray.....	33.0	52.0
Sand, very fine to medium, trace coarse, trace rootlets, gray.....	52.0	76.0
Sand, very fine to medium, trace coarse, trace rootlets, possible organics, slightly silty, thin silt seams, light gray.....	76.0	85.0
Sand, very fine to medium, trace coarse, light gray.	85.0	98.0

Test Hole #52-C-81 (E-log)
(20N-35W-34cacb)
McPherson County

Location: NW SW NE SW sec. 34, T. 20 N., R. 35 W. Distances and elevation determined by Twin Platte NRD survey crew.
Ground elevation: 3,455.82 ft. (i). (Whitewater Lake 7.5 min. quadrangle).
Depth to water: 0.88 ft. (8-17-81).
Total depth: 18 ft.

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:		
Sand, very fine to fine, trace medium, slightly silty, snail shell fragments, brown to light brown.....	0.0	7.5
Sand, very fine to fine, trace medium, moderately silty, gray.....	7.5	9.5
Sand, very fine to fine, trace medium, slightly silty, light gray.....	9.5	18.0